Regime design and cooperation: Differential treatment of parties in international environmental agreements

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Regime design and cooperation: Differential treatment of parties in international environmental agreements

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Abstract

Many international environmental agreements (IEAs) have adopted differentiated rules for groups of countries, based on the recognition of the different circumstances of parties, such as special needs of certain parties (especially developing countries), or the different contribution of parties to the environmental problem at hand. The resulting differential treatment usually consists of differences in the stringency of obligations, different timing of their application, and/or international financial, capacity-building or technological assistance. The existence (and design) of preferential treatment for some groups of parties may be a precondition for their entering the agreement in the first place. But in the long term, some types of preferential treatment may lead to new incentives that make broader (and deeper) cooperation more difficult, as observed for the climate change regime by Castro et al. (2011).

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Keywords: International environmental agreements; regime design; negotiation; cooperation

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"All States enjoy sovereign equality. They have equal rights and duties and are equal members of the international community, notwithstanding differences of an economic, social, political or other nature."

1970 Declaration of Principles of International Law

„[...] equity shall be reflected by having a fair sharing and equitable allocation framework wherein developed country Parties take the lead in undertaking deep binding emission reductions in the short-, mid- and long-term that reflect their historical and current responsibility for global emissions and in providing finance, technology and capacity building to developing countries."

Submission by China, India, Malaysia, Philippines and Thailand
to the UNFCCC, 3 October 2011

1. Introduction

Differential treatment of parties to an international environmental agreement (IEA) has become a relatively common feature of international law. Several multilateral environmental agreements, including the 1982 United Nations Convention on the Law of the Sea, the 1983 International Undertaking on Plant Genetic Resources, the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, the 1992 Convention on Biological Diversity, the 1992 Framework Convention on Climate Change and the 1994 Convention to Combat Desertification, among others, have incorporated the notion of differentiated responsibility of states with respect to the protection of the environment. The basis of this differentiated responsibility is the recognition, already in Principles 6 and 7 of the Rio Declaration, of countries' different circumstances and levels of contribution to environmental degradation (UN 1992). The resulting differential treatment usually consists of less stringent obligations, different timing of the application of provisions (i.e. grace periods or delayed implementation of obligations, or priority implementation in specially affected countries), and international assistance in terms of financing, capacity building and/or technology transfer (Matsui 2002; Hepburn and Ahmad 2005). Beyond the environmental domain, also the World Trade Organization includes "Special and Differential Treatment" provisions for developing countries and Least Developed Countries, based on the notion that countries at different levels of development have different trade policy needs. Both in the context of the climate change convention and of the WTO it has already been noted that the created country categories have become rigid and are being considered as negotiation goals themselves: an academic discussion about how to make this differential treatment more flexible and dynamic has emerged (Berk and den Elzen 2001; Hoekman et al. 2004; Kasteng et al. 2004; Page and Kleen 2005; Castro et al. 2011; Winkler and Rajamani 2013).

Legal scholars have examined such country differentiation in international agreements from a normative perspective (Cullet 1999; Halvorssen 1999; Rajamani 2000; Cullet 2003; Hoekman et al. 2004; Hepburn and Ahmad 2005; Page and Kleen 2005; Rajamani 2006; Honkonen 2009). They have detailed the

philosophical basis for the departure from the notion of equality to a notion of equity in international environmental law, discussed the arguments supporting and opposing the introduction of differential treatment and categorized the differential treatment provisions existing in several IEAs. Rajamani (2006), for example, classifies differential treatment provisions into those that differentiate with respect to the central obligations contained in the treaty (e.g. targets for only one group of countries), those that differentiate with respect to the implementation of obligations (e.g. delayed compliance schedules, different base years, softer non-compliance rules), and those that provide assistance to comply with obligations (capacity building, technology transfer, finance). Magraw (1989) has recognized that while some differential treatment provisions are explicit in the treaty texts, some are implicit, in the sense that the provision establishes identical treatment to all parties, but its application allows considering characteristics that vary from country to country (e.g. refer to a state's technical and regulatory ability or its resource availability).

So far, however, there is no study that looks at the effect of differential treatment on the effectiveness of international agreements in a comparative manner. Such an analysis can provide evidence about why preferential treatment is agreed upon, how such preferential treatment is designed and what potential effects on the regime's effectiveness it can have.

Differential treatment of parties to an international agreement can be conceived as akin to the 'flexibility provisions' as defined by Rosendorff and Milner (2001). The academic debate around such flexibility provisions deals with whether they encourage countries to engage in deeper cooperation, or whether they rather make cooperation meaningless (Koremenos et al. 2001; Kucik and Reinhardt 2008). One of the key challenges of the academic discussion is that such flexibility provisions are endogenous to the decision of countries to enter the agreement and to their level of commitment within the agreement. Fearon (1998) argues that there is a trade-off between efficient bargaining and effective agreements. In our case, the existence (and specific design) of preferential treatment for some groups of parties may be a precondition for their entering the agreement in the first place. But in the long term, some types of preferential treatment may lead to new incentives that make broader (and deeper) cooperation more difficult, as observed for the climate change regime by Castro et al. (2011).

In this article, I consider the relationship between the existence of differential treatment of parties to an IEA and three types of outcomes of the bargaining process that led to the adoption of the IEA: (i) country participation in the agreement, (ii) compliance of parties with the agreement's provisions, and (iii) solving the problem that the agreement was supposed to address. I do so by drawing on data from the International Regimes Database (IRD) on the formation, attributes and outcomes of 172 regime elements within 23 international environmental regimes. The article aims to contribute to the academic discussion on the trade-off between flexibility in regime design and efficient negotiations (Downs et al. 1996; Fearon 1998; Rosendorff and Milner 2001; Kucik and Reinhardt 2008).

The next section outlines the theory behind the hypotheses regarding the effects of differential treatment on IEA outcomes. Section 3 describes the operationalization, data and methods. The results are presented in section 4. Section 5 provides first conclusions and outlines areas for future research.

2. Differential treatment, cooperation and effectiveness of IEAs

Institutionalist IR theory has recently devoted some attention to the study of the relationship between bargaining and depth of cooperation. As observed by Downs et al. (1996), the fact that many existing international regimes achieve good levels of compliance without much attention to enforcement may be due to the fact that most of these agreements require member states to make only small adjustments in policy, thus giving them little incentive to defect. Fearon (1998) responds by arguing that there is a trade-off between the bargaining phase and the implementation and enforcement phase of international cooperation problems: the greater the gains from cooperation are expected, the harder will governments bargain, and the more difficult it will be to reach a cooperative outcome. There is thus a trade-off between efficient bargaining and effective agreements. In line with this argument, the work on flexibility in international agreements looks at whether including flexibility provisions in such agreements can facilitate cooperation in the first place (Koremenos et al. 2001; Rosendorff and Milner 2001; Kucik and Reinhardt 2008).

This article follows this existing literature to investigate the effect of differential treatment on three different measures of cooperation and regime effectiveness: (i) country participation in the agreement, (ii) compliance of parties with the agreement's provisions, and (iii) solving the problem that the agreement was supposed to address.

Differential treatment aims to satisfy the interests of particular parties that, while willing to be cooperate in the solution of an international problem, are in a disadvantaged situation to do so: either because their specific circumstances make cooperation more costly for them (e.g. developing countries usually argue that they first need to achieve development and reduce poverty before tackling environmental problems), or because they are not important contributors to the problem. Differential treatment may provide these countries with additional time to achieve specific commitments, may grant them technological or financial assistance to do so, or may exempt them altogether of commitments (see Appendix 1 for an overview of differential treatment provisions in some IEAs). Particularly if substantial heterogeneity exists across parties (or potential parties) to an agreement, differential treatment may make them easier to be ratified (Swanson 2001). At the same time, being party to the agreement allows these countries to have a voice (and, under the frequently used unanimity and consensus voting rules, even a veto) in future decision-making within the regime. Being a party may also be tied to receiving certain benefits (in addition to the improvement of the environment, which is often a public good and hence non-excludable). It is to be expected, thus, that differential treatment will make it more attractive to states to become parties to the agreement. This is what I expect under hypothesis 1:

H1: Differential treatment increases the likelihood that states will become parties to the agreement.

As differential treatment provides support for some parties to comply with the agreement, in the form of financial and/or technical assistance, or through delayed compliance schedules, simplified commitments or exemptions, it is expected that the existence of differential treatment will improve parties' compliance:

H2: Differential treatment increases the likelihood that states will comply with the provisions of the agreement.

Differential treatment grants specific privileges (financial and technical support, delayed compliance schedules, simplified commitments, etc.) to certain groups of countries. To the extent that some of these privileges water down the level of stringency of commitments to tackle the environmental problem at hand, differential treatment will reduce the effectiveness of the IEA in addressing the problem. In

addition, countries subject to these privileges – e.g. countries initially granted exemptions from economic or environmental obligations – have an incentive to lobby for the continuation or expansion of this preferential treatment in subsequent negotiation rounds. In the long term, this may prevent the evolution of the regime into a more inclusive one in which more countries take up commitments and actively contribute to the solution of the problem – differential treatment becomes path-dependent (Castro et al. 2011).

H3: Differential treatment reduces the likelihood that an agreement will be effective in solving the environmental problem being addressed.

3. Operationalization, data and methods

The hypotheses described above are tested in a multivariate logistic regression framework using data from the International Regimes Database (IRD) (Breitmeier et al. 1996; Breitmeier et al. 2006). The IRD is a very complete dataset describing, with over 200 variables, the formation, attributes and outcomes of 23 international environmental regimes, which were coded by international experts on the basis of a common data protocol. Its unit of analysis is the "regime element": a period of time within an environmental regime, in which the operation of the regime is continuous, and its principles, key norms, leading actors and functional scope remain broadly the same (Breitmeier et al. 1996). For example, the regime for Long-Range Transboundary Air Pollution (LRTAP) is subdivided into the following six regime elements:

- LRTAP Convention 1979-1982
- LRTAP Convention 1982 -1998
- First Sulphur Protocol 1985-1998
- NOx Protocol 1988-1998
- VOCs Protocol 1991-1998
- Second Sulphur Protocol 1994-1998.

Each of these elements constitutes a separate observation in the dataset, because a significant change in the characteristics of the regime happened between them. Most regimes (and their regime elements) have been coded independently by two different experts. All in all, the dataset hence comprises 172 observations (coded regime elements) within 23 regimes or issue areas.

Dependent variables

For the operationalization of two of the dependent variables, as well as for the selection of appropriate controls that are also expected to affect compliance and IEA effectiveness, this paper builds upon the regression models used in Breitmeier et al. (2011). To test the first hypothesis I use the variable signature_failure, which is based upon variable 109G of the IRD (NEGOTIATE_NO_SIGNATURE: Did potential signatories participate in the negotiations but fail to sign the agreement reached?). This is clearly a very broad measure of the likelihood that states will become parties to the agreement, as it is just a binary indicator at the agreement level. IRD does not provide comparable figures about number of parties to an agreement, as the cases included have different universes of potential members, and have been negotiated at very different times. No comparable dependent variable was tested in Breitmeier et al. (2011), who only focused on the following two measures of effectiveness. According to hypothesis 1, I expect that differential treatment will have a negative effect on signature_failure.

The second hypothesis, on the likelihood that states will comply with the provisions of the agreement, is operationalized in the same way as in Breitmeier et al. (2011): the variables CONFORMITY_ALL_MEMBERS (Did all members generally conform with the provisions of the regime rules?) and CONFORMITY_CAUSAL (Did the regime have a causal influence on the degree of conformance of its members?) (both under variable 303A in the IRD) are first dichotomized and then multiplied to generate the variable effect_compliance. Effect_compliance hence takes the value of 1 if the regime had a causal positive influence on compliance, and zero in all other cases. It has a missing value whenever any of the two constituent variables also has a missing value. Following hypothesis 2, I expect that differential treatment will have a positive effect on effect_compliance.

The third hypothesis on the effectiveness in terms of problem-solving, is again operationalized as in Breitmeier et al. (2011): the variables PROBLEM_CHANGE (How did the state of the world change during this period with respect to the problems addressed by the regime?) and PROBLEM_CHANGE_CAUSAL (Did the regime exert a causal influence on these developments?) (both under variable 304A in the IRD) are dichotomized and multiplied with each other to generate the variable effect_problemchange, which indicates whether the regime has had a positive causal effect on the improvement of the problem being addressed. In the IRD, PROBLEM_CHANGE and PROBLEM_CHANGE_CAUSAL are both coded at the problem level: for each regime element, one or several problems being addressed were identified, and these two variables were coded for each of these problems. To generate the variable at the regime element level, I take the mode of the values that the variables take at the problem level before dichotomizing them. Following H3, I expect that differential treatment will have a negative effect on effect_problemchange.

Main explanatory variables

The IRD dataset includes several variables that in some way or another depict differential treatment of states within a regime. The variable MEMBER_CATEGORY (208D in the IRD) asks whether there is a single category of membership or whether there are provisions establishing more than one category of membership. MEMBER_ROLE_DIFFERENTIATE (208E) asks whether the regime's provisions allow for role differentiation among the members. Both variables are dichotomous and at the regime element level. In addition, the variable RULE_DIFFERENTIATE (205E) asks, for each substantive rule coded within each regime element, whether it differentiates among its members in terms of requirements, prohibitions, or permissions. Due to the slight nuances between these variables, it is likely that in some cases they are describing the same differentiation, but in others they are not. To capture whether there is any differentiation among members of the regime at all, I first create the variable DIFF_ANYRULE, which shows whether any rule within each regime element differentiates among its members, on the basis of RULE_DIFFERENTIATE. Then I generate the variable any_differentiation, which is coded as 1 if any one of the three variables, MEMBER_CATEGORY, MEMBER_ROLE_DIFFERENTIATE and DIFF_ANYRULE, is 1 (no matter if any one of the others has a missing value), and as zero otherwise. Any_differentiation is the main explanatory variable.

Differential treatment of members to IEAs frequently appears in form of financial support. The IRD includes the variable FINANCIAL_MECHANISMS (211C) that describes each regime's financial mechanism, including, inter alia, following categories: 3 = Trust fund or similar mechanism to support the regime's administration and national participation of developing countries; 4 = Trust fund or similar financial mechanism to compensate states for certain activities in the international/global interest; 5 = Trust fund or similar financial mechanism to subsidize national compliance; 6 = Trust fund or similar mechanism to protect resources that remain under national sovereignty. I create a dummy variable,

finance_devctys, that takes the value of 1 for all regimes in which FINANCIAL_MECHANISMS includes category 3, and a dummy variable finance_compensate, that takes the value of 1 for all regimes in which FINANCIAL_MECHANISMS includes 4, 5, or 6. Finance_devctys hence indicates whether the regime provides funding for developing countries' participation in negotiations and meetings. Finance_compensate indicates whether the regime provides compensation or a subsidy for activities linked to compliance with its aims. While the IRD coding does not take into account that such compensation or subsidy payments may be themselves differentiated across member groups, it is possible that such financial support appears together with differentiation. Finance_devctys and finance_compensate will hence be tested as potential complements to any_differentiation.

Controls

Of course, participation in a regime, compliance and effectiveness do not depend solely on differential treatment of member parties. The literature on regime effectiveness supports the idea that the characteristics of the problem at hand are an important predictor of effectiveness, as well as the level of uncertainty with respect to the potential solutions to it, the distribution of power among the parties and the institutional characteristics of the regime (Mitchell 1994; Miles et al. 2002; Breitmeier et al. 2006). I follow Breitmeier et al.'s (2011) choice of explanatory variables to establish a baseline model of compliance and effectiveness. Problem_understood is a categorical variable describing how well the nature of the problem was understood (the higher its value, the better the understanding of the problem). It is based on variable 104A of IRD, which is coded at the problem level. Hence, problem_understood is summarized at the regime element level by taking the mode for each regime element. It is used as a proxy for the notion of level of uncertainty with respect to solutions to the environmental problem being addressed: the higher the understanding, the lower the uncertainty, and hence the higher the compliance with and the effectiveness of the regime.

Problem malignancy is used in Breitmeier et al. (2011) to depict the level of complexity of the problem in terms of how incompatible the interests of the parties were and whether there was an incentive to disobey the rules of the regime. Accordingly, it is generated as the sum of the IRD variables INTEREST_DISOBEY and INTEREST_COMPATIB. The higher the malignancy, the lower the expected compliance and the effectiveness. Powersetting_asymmetry is included to control for the level of asymmetry between the nations involved in terms of issue-specific power resources.

In terms of institutional variables, ruleused_mode describes the most frequent type of rule used in the regime's decision-making processes (in increasing order, qualified majority, consensus, unanimity); deep_rules indicates whether the regime is deep with respect to the density and specificity of its rules; rulebinding indicates how strongly legally binding the regime's rules are; and compliance_managerial indicates whether the regime uses a managerial approach to compliance (rather than an enforcement one).

Appendix 2 describes all variables in more detail, including their summary statistics. Appendix 3 presents a correlation table.

Methods

The three hypotheses are tested using logistic regressions, with the errors clustered at the regime level to account for the non-independence between observations (regime elements) describing several stages of the same regime. Due to the low number of observations (several values are missing for some variables), not all control variables are included at the same time in the regressions.

3. Results

Baseline models replicating Breitmeier et al.'s (2011) regressions (without the country differentiation variables) are included in Appendixes 4 and 5 for comparison. Tables1 to 3 present the results of the effect of differential treatment on signature failure (H1), compliance (H2) and problem solving effectiveness (H3), respectively.

The results in Table 1 show a consistently significant positive effect of country differentiation on the likelihood that potential regime signatories that participated in the negotiations did not sign the agreement in the end. This result is against the theoretical expectations, and fails to provide support for Hypothesis 1. A potential explanation for this unexpected result, already discussed shortly above, is the broadness of the signature_failure variable. A better indicator of the likelihood that states become parties to the agreement would be the number of states that eventually did become parties, divided by the number of potential parties. Another possible explanation is that countries that do not benefit from the differential treatment may be less likely to enter an agreement in which such provisions are in place. The Kyoto Protocol, which was never ratified by the US, is an example of such a case. Already during the democratic Clinton government, the US Senate failed to ratify the treaty because it did not meet the minimum requirements it had set for such ratification (Mathews 2000). Among these unmet requirements was the one of "meaningful participation of developing countries in binding commitments limiting greenhouse gases", which is one of the critical differential treatment provisions in the Kyoto Protocol. Once Bush took seat as US president, opposition to the treaty only increased.

Interestingly, however, the finance variables show a negative effect on signature failure, which is robust to different combinations of the control variables (not shown here but available on request). Particularly the variable finance_devctys, which indicates the existence of financial support for the participation of developing countries in negotiations, is relatively close to significance, and in some other regression specifications becomes significant at the 5% level. The variable finance_compensate is, in contrast, never really close to significance. This effect would mean that one particular form of differential treatment, providing support for developing countries to participate in negotiations, increases the likelihood that states become parties to the agreement, which is in line with Hypothesis 1.

Table 2 shows that differential treatment tends to increase the likelihood that states will comply with the agreement, supporting Hypothesis 2. The results are however not completely robust and the statistical significance is relatively low. Again, this is likely related to the low number of observations. None of the finance variables seems to have a clear effect on compliance: the results are never significant and also their sign is not consistent across different specifications tested but not shown in Table 2.

In terms of Hypothesis 3, while in Table 3 we see a positive relationship between differential treatment and problem-solving effectiveness, the coefficients are never close to significance. This means that, while we fail to find support for the hypothesis that differential treatment reduces the likelihood that the agreement will be effective, we also fail to find support that it increases such likelihood. Quite surprisingly, provision of finance has a significant and negative effect on problem-solving effectiveness, which is robust to several specifications tested but not shown here. Such finding goes beyond Hypothesis 3 and is again difficult to explain. Our theory is that differential treatment reduces effectiveness as it waters down environmental commitments in the regime, and as it creates additional incentives for benefitted countries to lobby for the continuation of privileges, reducing the ability of the regime to evolve in time and increase its scope. But the empirical finding so far refers only to the provision of finance – it is difficult to explain why providing finance for the participation of developing countries in negotiations or for

compensation or subsidization of compliance costs would reduce effectiveness instead of increasing it. Further research is needed to clarify this finding.

Table 1: Effect of differential treatment on signature failure

	(SIGN1) Logit clustered errors	(SIGN2) Logit clustered errors	(SIGN3) Logit clustered errors	(SIGN4) Logit clustered errors	(SIGN5) Logit clustered errors	(SIGN6) Logit clustered errors
any_differentiation	2.363 ***	2.275 ***	2.706 ***	1.779 **	3.114 ***	3.204 **
	(0.853)	(0.877)	(0.890)	(0.822)	(1.187)	(1.262)
finance_devctys					-1.286	
					(0.782)	
finance_compensate						-0.923
						(1.240)
problem_understood	-0.630	-0.783 *	-0.993 **	-0.849 *	-1.087 ***	-1.089 **
	(0.422)	(0.414)	(0.452)	(0.481)	(0.414)	(0.424)
malignancy	-0.339	-0.326	-0.343	-0.355	-1.024 ***	-1.003 ***
	(0.273)	(0.261)	(0.259)	(0.235)	(0.286)	(0.244)
ruleused_mode	-0.886	-0.742	-0.613		0.204	-0.0813
	(0.683)	(0.726)	(0.779)		(1.042)	(0.972)
powersetting_asymmetry	0.138	0.172	-0.120	0.786 *	1.714 ***	1.554 ***
	(0.565)	(0.524)	(0.565)	(0.457)	(0.551)	(0.523)
deep_rules		0.400	0.524	0.484		
		(0.367)	(0.350)	(0.371)		
rulebinding			0.973			
			(0.741)			
compliance_managerial				-0.0594		
				(0.794)		
Constant	2.927	1.685	-0.653	-1.420	1.884	2.539
	(2.657)	(3.199)	(3.539)	(2.096)	(3.186)	(3.063)
Observations	89	88	87	91	78	78
Number of clusters	32	32	32	30	29	29
Pseudo-R2	0.231	0.249	0.316	0.234	0.433	0.420
Log likelihood	-42.62	-41.31	-36.85	-40.22	-27.29	-27.92

Note: Standard errors in parentheses. Significance levels are *** 0.01; ** 0.05; * 0.10.

Going over to the control variables, a higher understanding about the problem being addressed reduces the chance of signature failure, increases the likelihood that states will comply with the agreement, and increases the problem-solving effectiveness of the agreement. These results are all in line with expectations, and correspond to the findings of Breitmeier et al. (2011). They are robust to the different specifications tried. In some cases, the results lose statistical significance, which is partly due to the low number of observations in the analysis, but the direction of the effect never changes.

The malignancy of the problem being addressed has a negative effect both on the chance of signature failure and on compliance. These effects are robust in terms of their sign, and sometimes reach statistical significance. While the first one goes against expectations (one would expect that more complex problems are more likely to experience signature failure), the second one is in line with findings by Miles et al. (2002).

A higher power asymmetry between the negotiating states leads to a higher likelihood of signature failure and to a lower likelihood of compliance, but with weak statistical significance. These results however are in line with theoretical expectations expressed in Breitmeier et al. (2011). While this variable always displays negative coefficients in the regressions on effectiveness, these are never close to significance.

Among the institutional variables, the depth of rules has a clearly positive effect on both compliance and effectiveness, which is also in line with previous findings, but has no clear effect on signature failure. A managerial approach to compliance appears to have a negative effect on effectiveness, but not to affect the other dependent variables in a meaningful way. No clear effects are found for the two other institutional variables: the type of rule used in decision-making, and whether the rules are mostly binding or not.

Table 2: Effect of differential treatment on regime compliance

	(COMP1) Logit clustered errors	(COMP2) Logit clustered errors	(COMP3) Logit clustered errors	(COMP4) Logit clustered errors	(COMP5) Logit clustered errors	(COMP6) Logit clustered errors
any_differentiation	1.074	1.775 *	1.831 *	-0.0122	1.255	1.717 *
	(0.952)	(0.964)	(0.992)	(1.037)	(0.873)	(0.964)
finance_devctys					1.338	
					(1.501)	
finance_compensate						-0.740
						(0.969)
problem_understood	0.747 *	0.741 **	0.798 *	0.637	0.890 **	0.642
	(0.384)	(0.368)	(0.419)	(0.526)	(0.384)	(0.414)
malignancy	-0.541 **	-0.355	-0.341	-0.124	-0.765 **	-0.733 **
	(0.264)	(0.281)	(0.288)	(0.213)	(0.335)	(0.313)
ruleused_mode	-0.832	-0.495	-0.455		-1.462	-1.102
	(0.903)	(0.853)	(0.880)		(0.929)	(0.941)
powersetting_asymmetry	-0.224	-0.615	-0.568	-1.191 *	-0.379	-0.332
	(0.474)	(0.569)	(0.576)	(0.682)	(0.558)	(0.488)
deep_rules		0.826 *	0.859 *	1.105 **		
		(0.450)	(0.476)	(0.472)		
rulebinding			-0.596			
			(0.627)			
compliance_managerial				-0.275		
				(1.628)		
Constant	5.354 *	1.855	2.962	2.056	7.953 **	7.666 **
	(3.187)	(3.148)	(3.124)	(2.862)	(3.613)	(3.446)
Observations	79	77	77	88	66	66
Number of clusters	30	30	30	31	26	26
Pseudo-R2	0.241	0.315	0.322	0.346	0.345	0.326
Log likelihood	-25.53	-22.82	-22.58	-21.70	-19.47	-20.03
% correct predictions	87.34	81.82	83.12	92.05	89.39	87.88

Note: Standard errors in parentheses. Significance levels are *** 0.01; ** 0.05; * 0.10.

Table 3: Effect of differential treatment on regime problem-solving effectiveness

	(EFF1) Logit clustered errors	(EFF2) Logit clustered errors	(EFF3) Logit clustered errors	(EFF4) Logit clustered errors	(EFF5) Logit clustered errors	(EFF6) Logit clustered errors
any_differentiation	0.370	0.160	0.235	0.636	0.757	1.060
	(0.679)	(0.703)	(0.726)	(0.623)	(0.707)	(0.770)
finance_devctys					-3.974 ***	
					(1.244)	
finance_compensate						-1.715 *
						(0.985)
problem_understood	0.544 **	0.466 *	0.479	0.335	0.465 *	0.481 *
	(0.252)	(0.276)	(0.300)	(0.322)	(0.250)	(0.252)
malignancy	-0.115	-0.0969	-0.0864	-0.0199	-0.139	-0.181
	(0.151)	(0.161)	(0.164)	(0.172)	(0.139)	(0.161)
ruleused_mode	-0.652	-0.451	-0.352		0.245	-0.609
	(0.444)	(0.448)	(0.457)		(0.511)	(0.574)
powersetting_asymmetry	-0.0305	-0.00945	0.216	0.0241	0.213	-0.0306
	(0.265)	(0.238)	(0.328)	(0.291)	(0.313)	(0.321)
deep_rules		0.534 **	0.564 **	0.622 **		
		(0.242)	(0.230)	(0.275)		
rulebinding			-0.567			
			(0.479)			
compliance_managerial				-1.644 *		
				(0.956)		
Constant	0.199	-1.636	-1.197	-1.937	-1.144	0.767
	(1.738)	(2.142)	(2.293)	(2.050)	(1.839)	(2.159)
Observations	99	97	96	104	86	86
Number of clusters	33	33	33	33	30	30
Pseudo-R2	0.0712	0.125	0.133	0.155	0.338	0.153
Log likelihood	-63.17	-58.50	-57.42	-60.49	-39.41	-50.40

Note: Standard errors in parentheses. Significance levels are *** 0.01; ** 0.05; * 0.10.

4. Conclusions and way forward

Differential treatment of parties to international environmental agreements has become a common feature of international law. In this article, I propose three hypotheses about how such differential treatment may affect three different stages of regime implementation: signature, compliance and problem-solving effectiveness.

The results found so far clearly indicate that differential treatment of parties to IEAs has an effect on regime implementation, although some of the findings are unexpected and require further analysis. I fail to find support for the first hypothesis, that differential treatment increases the likelihood that states will become parties to the agreement. Potential reasons for this finding are, empirically, the very broad dependent variable used in the analysis and, theoretically, the reasoning that countries that are not to be benefitted by differential treatment decide not to enter the agreement due to feared opposition of the agreement to their interests. At the same time, this first hypothesis is supported by the finding that one particular form of differential treatment, providing support for developing countries to participate in negotiations, increases the likelihood that states become parties to the agreement. I find support for the second hypothesis which posits that differential treatment increases the likelihood of state compliance with the agreement, although the results are somewhat statistically weak, probably due to the low number

of observations included in the analysis. In this case, however, I do not find any additional effect of provision of finance on compliance. Finally, I do not find any evidence to support the third hypothesis, which is that differential treatment reduces the likelihood that an agreement will be effective in solving the problem it addresses. Rather surprisingly, I find that the provision of finance decreases such likelihood, which I cannot so far explain.

While acknowledging the limitations of this study, these findings provide a good starting point for further analysis. Empirically, the study is limited due to the low number of observations that can be used for analysis, which generally reduces significance levels of regression results, and which is particularly problematic in the case of logistic regression, as this type of regression relies on maximum likelihood estimation and hence on asymptotic assumptions. In addition, some of the variables used so far are, as explained above, very broad and may not reflect the actual features being modelled. Finally, differential treatment is not always implemented in the same way. As exemplified in Appendix 1 and discussed in detail by Rajamani (2006), different IEAs have designed differential treatment in various ways, and these different designs may themselves be quite relevant for regime compliance and effectiveness. For example, in the case of the climate change regime, quite rigid groups with and without commitments were established on the basis of fixed country lists. In contrast, in other cases, objective criteria were established under which countries would adopt commitments or not. The Montreal Protocol, for example, includes a clear criterion to define the countries with preferential treatment as those developing countries "whose annual calculated level of consumption of the controlled substances in Annex A is less than 0.3 kilograms per capita […]"(UNEP 2000). The resulting expectation is that, if negotiators agree early on upon automatic 'graduation rules' from one group to the other, or upon attaching privileges to the relevant country characteristics rather than to fixed country lists, then potential negative effects of differential treatment upon long-term environmental effectiveness might be overcome.

Bearing these limitations in mind, hence, the next steps in this research project will be to refine the statistical analysis in at least two ways: by including a more detailed coding of differential treatment, and by performing at least some of the analysis at the country-level, which would allow me to increase the number of observations significantly and also to test hypotheses differentiating countries that benefit from differential treatment from countries that do not. In addition, to find answers to some of the puzzling findings so far, this statistical analysis will be complemented with a qualitative, more in-depth comparative analysis of some IEAs with different design features of differential treatment.

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Appendix 1: Differential treatment provisions in some IEAs

IEA	Year signature / entry into force	Developing country parties (G77)	Industrialized country parties (OECD)	Other parties (EITs and others)	% of all countries	Type of differential treatment	Relevant text extracts (not exhaustive)
World Heritage Convention	1972 / 1975	128	30	31	95%	Context to implementation Financial assistance	Each party "will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain."; "Any State Party to this Convention may request international assistance for property forming part of the cultural or natural heritage of outstanding universal value situated within its territory."
CITES	1973 / 1975	121	30	28	90%	Context to implementation Financial assistance	creates a Trust Fund "to provide financial support for the aims of the Convention"; while no country differentiation is explicit in the treaty text, most protected species are in developing countries
Vienna Convention	1985 / 1988	132	30	35	99%	Context to implementation Financial assistance Technology transfer	takes into account "the circumstances and particular requirements of developing countries"
Montreal Protocol	1987 / 1989	132	30	35	99%	Context to implementation Delayed compliance schedules Flexible base years Financial assistance Technology transfer	"Any Party that is a developing country and whose annual calculated level of consumption of the controlled substances in Annex A is less than 0.3 kilograms per capita on the date of the entry into force of the Protocol for it, or any time thereafter until 1 January 1999, shall, in order to meet its basic domestic needs, be entitled to delay for ten years its compliance with the control measures set out in Articles 2A to 2E [...]" "special provision is required to meet the needs of developing countries, including the provision of additional financial resources and access to relevant technologies"
Basel Convention	1989 / 1992	120	29	30	90%	Context to implementation Financial assistance Technology transfer Participation assistance	takes into account "the limited capabilities of the developing countries to manage hazardous wastes"; recognizes the need to "promote the transfer of technology for the sound management of hazardous wastes […], particularly to the developing countries"
Basel Convention Ban Amendment	1995 / not yet	34	23	15	36%	Different central obligations Context to implementation Soft approach to non-compliance	"transboundary movements of hazardous wastes, especially to developing countries, have a high risk of not constituting an environmentally sound management of hazardous wastes" hazardous waste exports for final disposal and recycling are banned from Annex VII countries (EU, OECD and Liechtenstein) to non-Annex VII countries (all other parties)

IEA	Year signature / entry into force	Developing country parties (G77)	Industrialized country parties (OECD)	Other parties (EITs and others)	% of all countries	Type of differential treatment	Relevant text extracts (not exhaustive)
Convention on Biological Diversity	1992 / 1993	132	29	32	97%	Context to implementation Financial assistance Technology transfer Capacity building	"the provision of new and additional financial resources and appropriate access to relevant technologies can be expected to make a substantial difference in the world's ability to address the loss of biological diversity" "special provision is required to meet the needs of developing countries"
UNFCCC	1992 / 1994	131	30	34	98%	Different central obligations Context to implementation Flexible base years Delayed reporting schedule Financial assistance Technology transfer Capacity building Negotiation, participation and reporting assistance	notes "that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs"; "[…] the developed country Parties should take the lead in combating climate change and the adverse effects thereof"; "The specific needs and special circumstances of developing country Parties, […] should be given full consideration"; "The developed country Parties […] shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations [...]"
Convention to Combat Desertification	1994 / 1996	131	30	34	98%	Context to implementation Financial assistance Technology transfer Capacity building Participation assistance	"the high concentration of developing countries, notably the least developed countries, among those experiencing serious drought and/or desertification, and the particularly tragic consequences of these phenomena in Africa"; "the importance of the provision to affected developing countries, particularly in Africa, of effective means, inter alia, substantial financial resources [...] and access to technology, without which it will be difficult for them to implement fully their commitments under the Convention"
Kyoto Protocol	1997 / 2005	132	29	31	96%	Different central obligations Context to implementation Financial assistance Technology transfer Capacity building Negotiation and participation assistance Soft approach to non-compliance	"The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts […]"; "the developed country Parties and other developed Parties included in Annex II to the Convention shall [...] Provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in advancing the implementation of existing commitments [...]"

Source: Adapted and updated from Rajamani {%Rajamani 2006\, p. 94-121.

Appendix 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Description
effect_compliance	120	0.8417	0.3666	0	1	The regime has had a positive causal effect on conformity with regime provisions
effect_problemchange	145	0.3931	0.4901	0	1	The regime has had a positive causal effect on improvement of problem addressed
signature_failure	127	0.2913	0.4562	0	1	Did potential signatories take part in negotiations but fail to sign agreement?
any_differentiation	167	0.5269	0.5008	0	1	Is there any type of differentiation of regime members?
finance_devctys	119	0.3193	0.4682	0	1	Does the financial mechanism support developing country participation?
finance_compensate	119	0.1597	0.3678	0	1	Does the financial mechanism provide compensation/subsidies for activities/compliance?
problem_understood	168	2.7381	0.8907	1	4	Was the nature of the problem well understood?
malignancy	154	6.4935	2.2000	2	11	How malignant (complex and with incompatible interests) is the problem?
ruleused_mode	119	2.1008	0.5733	1	3	Decision rule most frequently applied in practice (higher = tougher)
powersetting_asymmetry	162	2.8395	0.9386	1	5	Were parties' power resources symmetrical or sharply different?
deep_rules	163	3.0184	1.1193	1	5	Is the regime shallow or deep as measured by the density and specificity of its
rulebinding	157	2.6752	0.7181	1	3	Is the rule legally binding? (mode within case_id)
compliance_managerial	121	0.9008	0.3001	0	1	Do procedures reflect a management (rather than enforcement) approach to compliance?

Appendix 3: Correlation table

	effect_ compliance	effect_ problem change	signature_ failure	any_differ entiation	finance_ devctys	finance_ compensate	problem_ understood	malignancy	ruleused_ mode	powersetting _asymmetry	deep_ rules	rule binding	compliance_ managerial
effect_compliance	1												
effect_problemchange	0.1516	1											
signature_failure	-0.0262	0.331	1										
any_differentiation	-0.031	0.1973	0.4554	1									
finance_devctys	-0.3382	-0.3742	-0.0089	0.1704	1								
finance_compensate	-0.1947	-0.463	-0.1367	0.3201	0.5323	1							
problem_understood	0.4407	0.2779	-0.3275	-0.1115	-0.2524	-0.4162	1						
malignancy	-0.4214	-0.0946	-0.1313	0.2316	0.0776	0.1723	-0.1435	1					
ruleused_mode	0.0423	-0.0148	-0.0912	-0.0576	0.1245	0.2339	0.0597	-0.2925	1				
powersetting_asymmetry	-0.4165	0.0749	0.3216	0.327	-0.028	-0.0527	-0.2384	0.6037	-0.3126	1			
deep_rules	0.2484	0.519	0.2341	-0.0979	-0.3277	-0.4763	0.2219	-0.2477	-0.1536	0.046	1		
rulebinding	-0.0201	-0.1539	0.2947	0.348	0.1103	-0.1228	0.0984	0.1344	-0.0373	0.4503	0.1547	1	
compliance_managerial	0.1994	-0.1133	-0.0389	-0.0639	0.0993	0.1866	-0.108	-0.1476	0.4654	-0.3068	-0.1357	-0.1461	1

Appendix 4: Baseline models: Determinants of regime compliance

	(BL1) Logit clustered errors	(BL2) Logit clustered errors	(BL3) Logit clustered errors	(BL4) Logit clustered errors	(BL5) Logit clustered errors
problem_understood	0.761 *	0.731 **	0.763 **	1.651 *	0.637
	(0.395)	(0.361)	(0.382)	(0.863)	(0.520)
malignancy	-0.535 **	-0.441	-0.442	-0.437	-0.124
	(0.266)	(0.306)	(0.314)	(0.287)	(0.207)
ruleused_mode	-0.887	-0.717	-0.707	-0.986	
	(1.121)	(1.143)	(1.160)	(1.117)	
powersetting_asymmetry	-0.0438	-0.182	-0.125	-0.667	-1.192 *
	(0.444)	(0.541)	(0.563)	(1.024)	(0.712)
deep_rules		0.575	0.585	1.063	1.106 **
		(0.412)	(0.418)	(0.773)	(0.479)
rulebinding			-0.504		
			(0.493)		
compliance_managerial				2.896 *	-0.278
				(1.544)	(1.557)
Constant	5.513	3.376	4.533	-0.728	2.055
	(3.705)	(4.116)	(4.325)	(3.741)	(2.872)
Observations	79	77	77	65	88
Number of clusters	30	30	30	27	31
Pseudo-R2	0.215	0.255	0.260	0.472	0.346
Log likelihood	-26.43	-24.83	-24.67	-13.80	-21.70
% correct predictions	87.34	83.12	83.12	90.77	92.05

Note: Standard errors in parentheses. Significance levels are *** 0.01; ** 0.05; * 0.10. These models replicate the regressions in Breitmeier et al. (2011), with slightly differently specified variables.

Appendix 5: Baseline models: Determinants of regime problem-solving effectiveness

	(BL6) Logit clustered errors	(BL7) Logit clustered errors	(BL8) Logit clustered errors	(BL9) Logit clustered errors	(BL10) Logit clustered errors
problem_understood	0.555 **	0.472 *	0.486	0.422	0.348
	(0.254)	(0.281)	(0.305)	(0.316)	(0.320)
malignancy	-0.103	-0.0941	-0.0817	-0.134	0.00430
	(0.142)	(0.158)	(0.160)	(0.174)	(0.176)
ruleused_mode	-0.717	-0.477	-0.393	-0.785	
	(0.496)	(0.476)	(0.486)	(0.508)	
powersetting_asymmetry	0.00831	0.00925	0.233	0.194	0.0858
	(0.230)	(0.207)	(0.316)	(0.234)	(0.262)
deep_rules		0.539 **	0.568 **	0.499 *	0.650 **
		(0.242)	(0.231)	(0.267)	(0.276)
rulebinding			-0.543		
			(0.471)		
compliance_managerial				0.0586	-1.464
				(0.827)	(0.932)
Constant	0.343	-1.587	-1.138	-1.014	-2.152
	(1.770)	(2.114)	(2.245)	(2.204)	(2.015)
Observations	99	97	96	82	104
Number of clusters	33	33	33	30	33
Pseudo-R2	0.0666	0.124	0.131	0.132	0.143
Log likelihood	-63.48	-58.55	-57.53	-49.25	-61.37
% correct predictions	68.69	68.04	67.71	63.41	67.31

Note: Standard errors in parentheses. Significance levels are *** 0.01; ** 0.05; * 0.10. These models replicate the regressions in Breitmeier et al. (2011), with slightly differently specified variables.